

Development of New Dielectric NDE Techniques for Spaceflight Materials

Completed Technology Project (2013 - 2015)



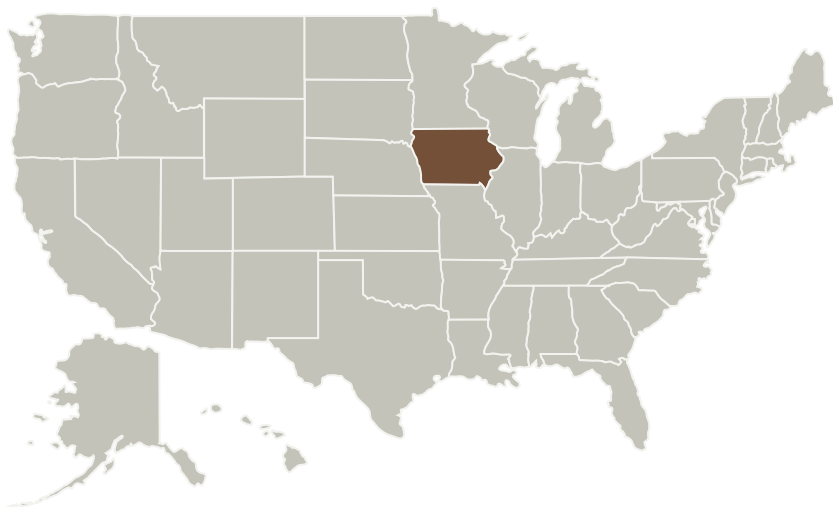
Project Introduction

Dielectric spectrometry will be performed on select spacecraft materials (i.e. heat shield materials, structural materials and insulating foams) to examine their capacitance and permittivity under controlled humidity. Three types of samples will be tested for each selected material, a dry, defect free sample, samples with known defects and moisture levels, and samples of unknown condition as a test of validity. Tests will be conducted from three microhertz to three gigahertz at temperatures ranging from -160°C to 400°C in order to obtain a full dielectric profile. The complex dielectric spectra acquired will be analyzed using computational modeling in order to determine the fit parameters associated with that material. These dielectric spectra and computational models will be used as the basis for proposals for new capacitance three-dimensional permittivity mapping sensor systems for monitoring structural health, extending a material's lifetime in high humidity environments (like those of Florida) and in forming improved repair processes.

Anticipated Benefits

This project will acquire dielectric spectra and develop computational models that will be used as the basis for potential capacitance three-dimensional permittivity mapping sensor systems for monitoring structural health, extending a material's lifetime in high humidity environments (like those of Florida) and in forming improved repair processes.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Space Technology Research Grants

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Organizations Performing Work	Role	Type	Location
Iowa State University	Supporting Organization	Academia	Ames, Iowa

Primary U.S. Work Locations

Iowa

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

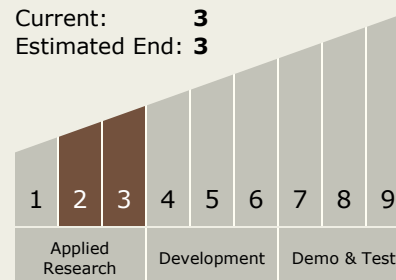
Nicola Bowler

Co-Investigator:

Nathan A Kleppe

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - TX12.3 Mechanical Systems
 - TX12.3.4 Reliability, Life Assessment, and Health Monitoring